Wind Power in Japan – An Overview

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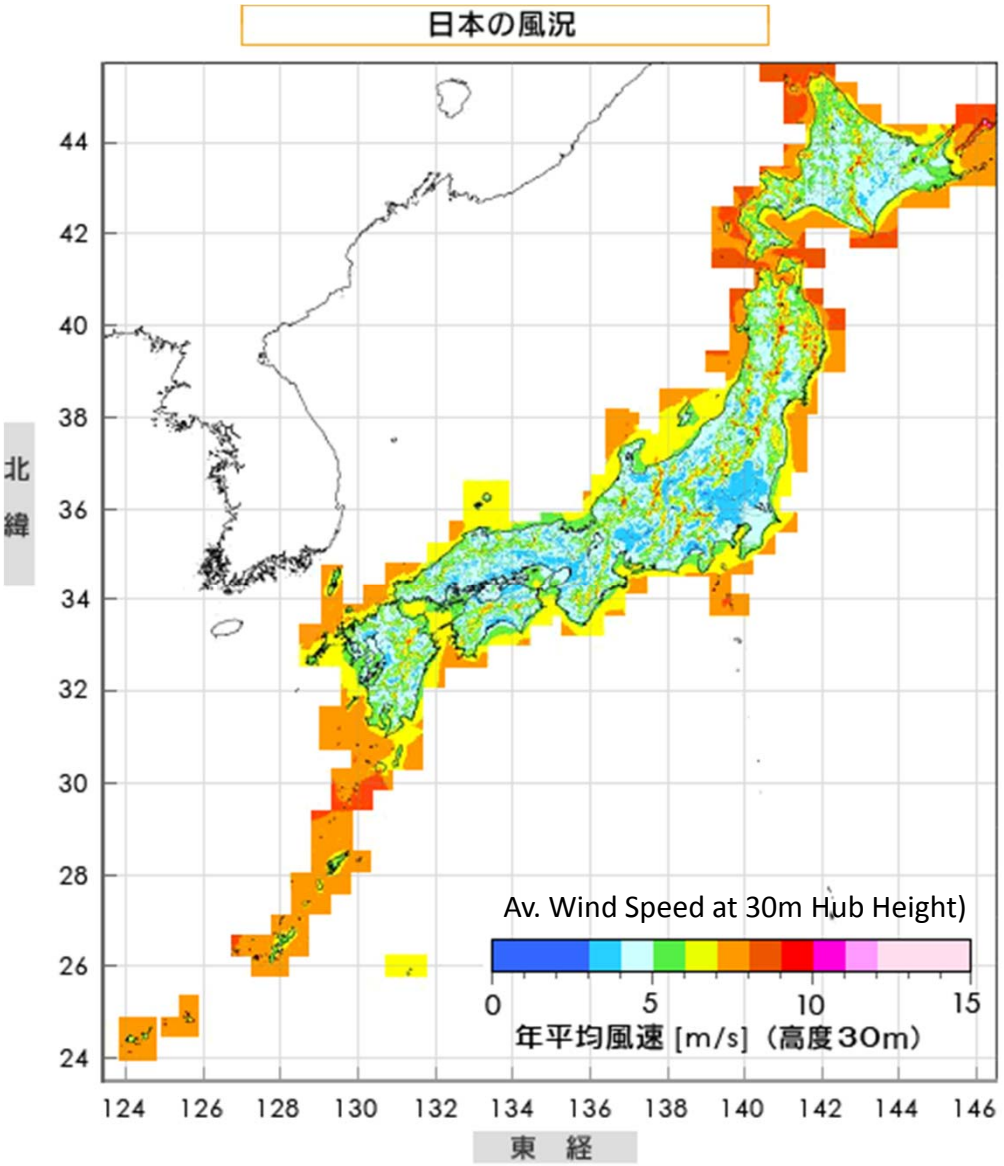


Source: NEDO 2011

Onshore Wind Power in Japan:

- Total Installed Wind Power (2011): 2,501 MW (1,832 Turbines at 417 Locations)
- Total Wind Power Output (2010): 3.936 TWh
- Wind Power Generation as % of total domestic Japan Demand (2010): 0.44%
- Annual mean Wind Speed ranging from 5.5 m/s to 7.5 m/s
- Total estimated potential in qualified areas in the range of 70 Million kW to 0.3 Billion kW. (Government Study of 2011)

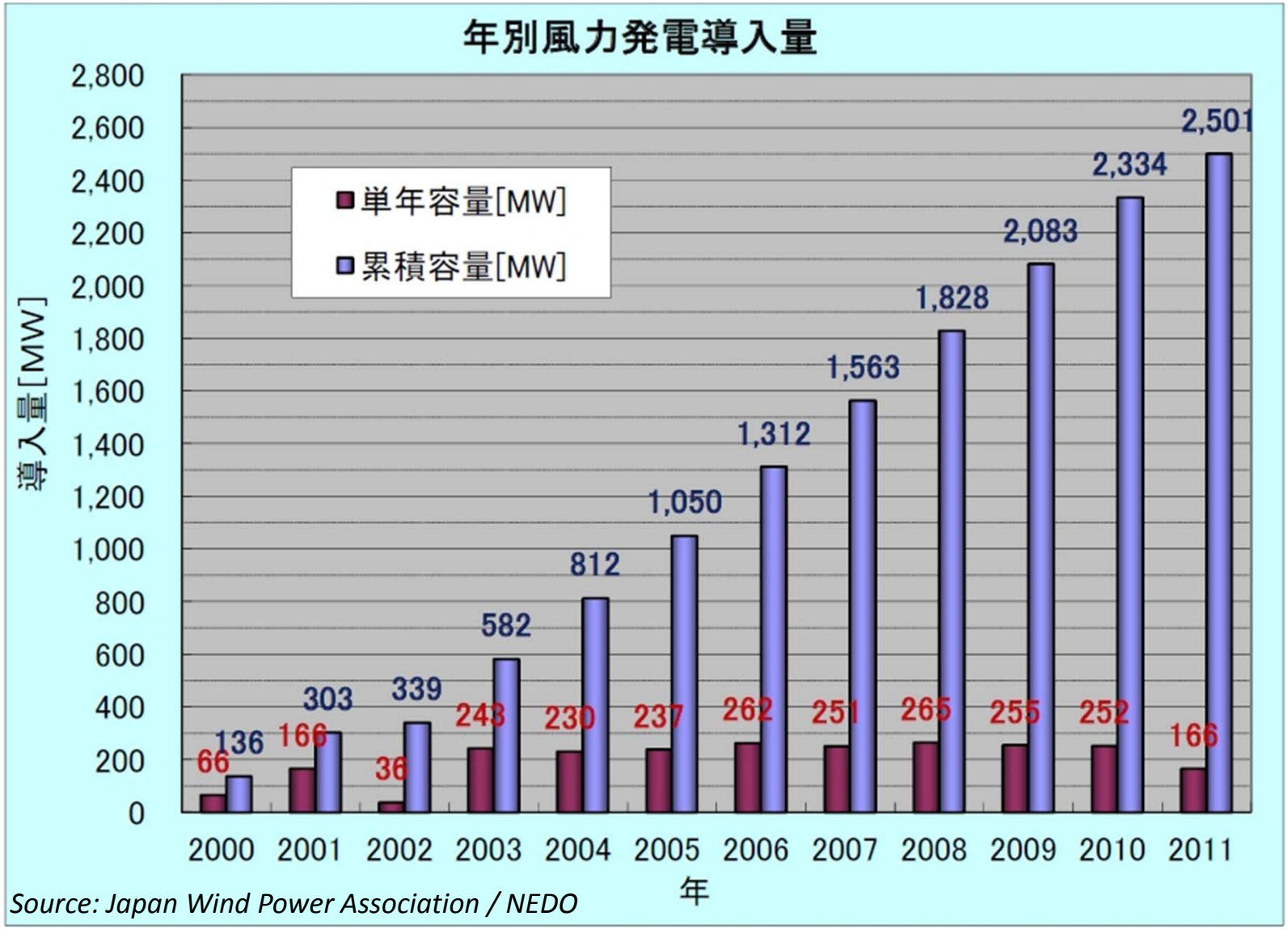
Original Government Wind Power Target was 3,000 MW installed and operating by 2010. Not achieved.

History of Wind Power in Japan Pre-Fukushima

- Wind power initially grew very rapidly in Japan, supported also by NEDO
- Between 2007 and 2010 the growth slowed due to
    - technical hazards and damage of WPGs by taiphoons and lightning, resulting in the development of the J-Class Wind Turbine Guidelines for Japanese conditions in 2008
    - Introduction of new building code in 2007, classifying turbines of 60m+ height as buildings and therefore requiring complex building permits
    - Introduction of new site guidelines in 2008
    - Grid connection issues
- Negative exchange rate impacts also slowed the growth as the majority of wind turbines in Japan are imported
- Growing NIMBY resistance in Japan re. onshore wind
- Japanese government focus on nuclear power and for renewables on solar PV
- In late 2008 Mitsubishi suspended selling their turbines in Japan due to the difficult Japanese market conditions and concentrated on Europe and US instead
- Siemens also withdrew for the same reason from the Japanese market

Installed Onshore Wind Power in Japan 2000 – 2011 (annual & cumulative)

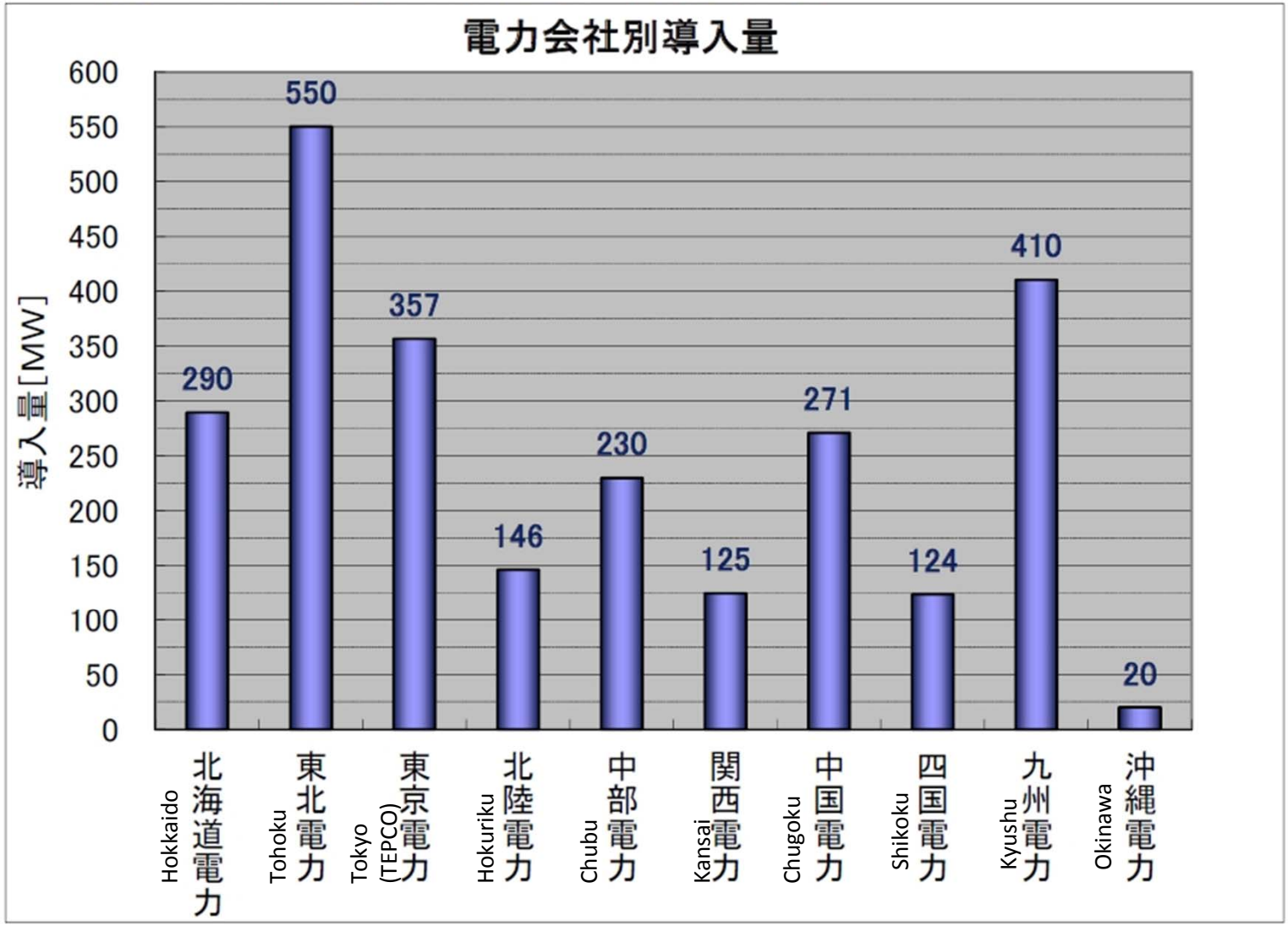
2011年末の導入実績



Source: Japan Wind Power Association / NEDO

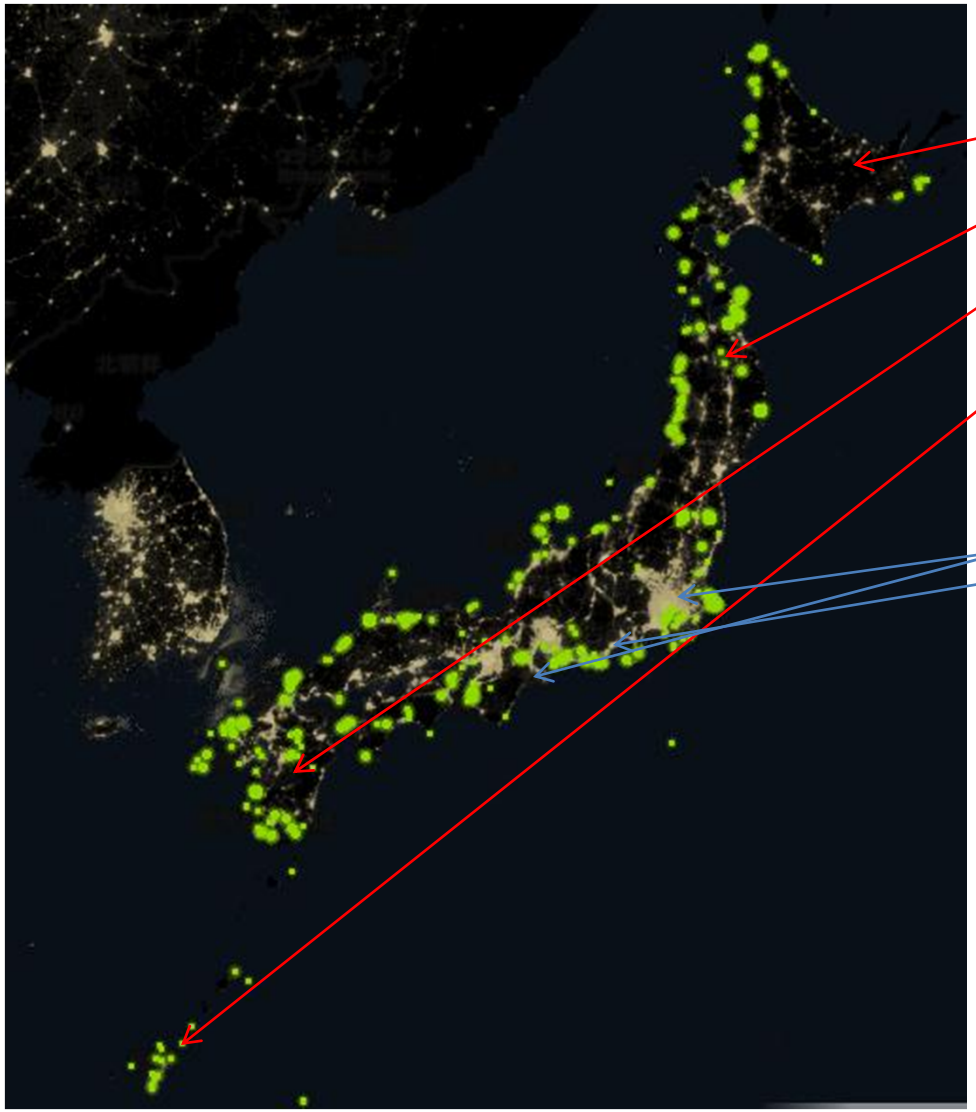
Installed and operating Onshore Wind Power by Utility (as of March 2012)

2011年度(2012 年 3 月末)の推定電力会社別導入量



Source: Japan Wind Power Association / NEDO

Onshore Wind Power Locations in Japan

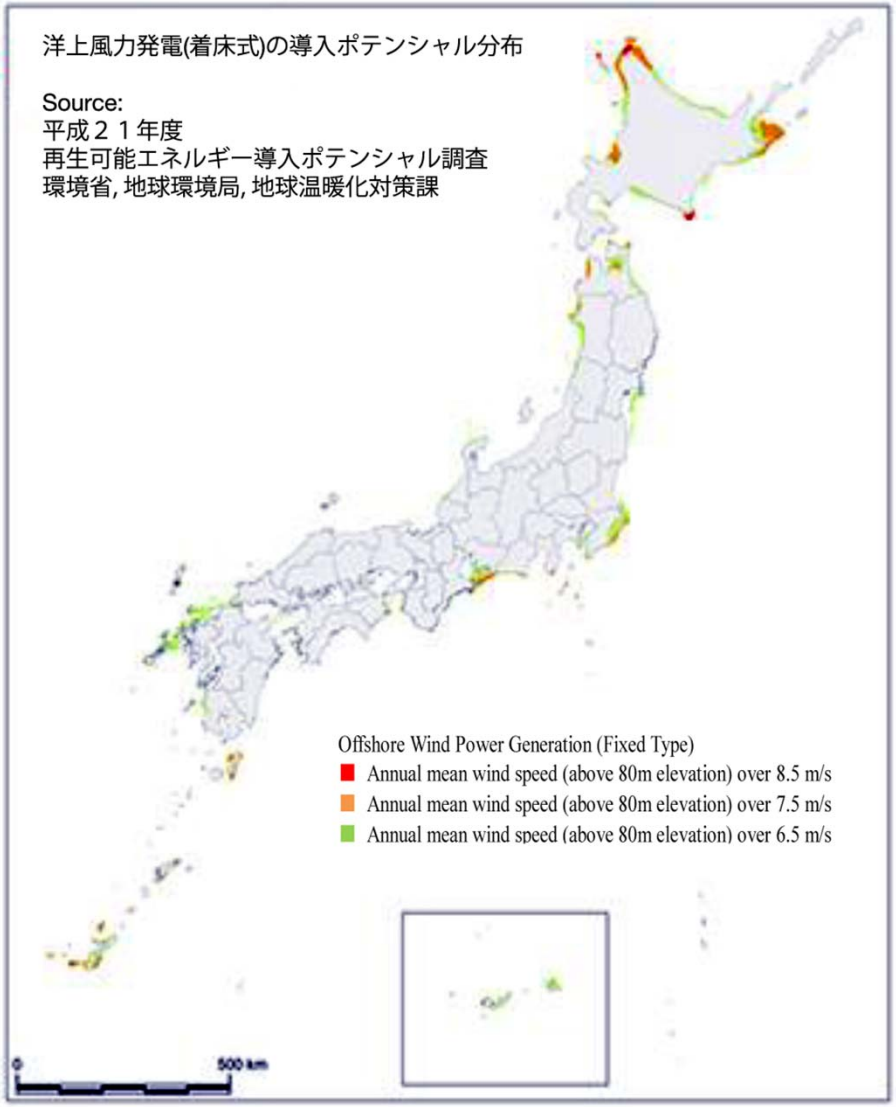


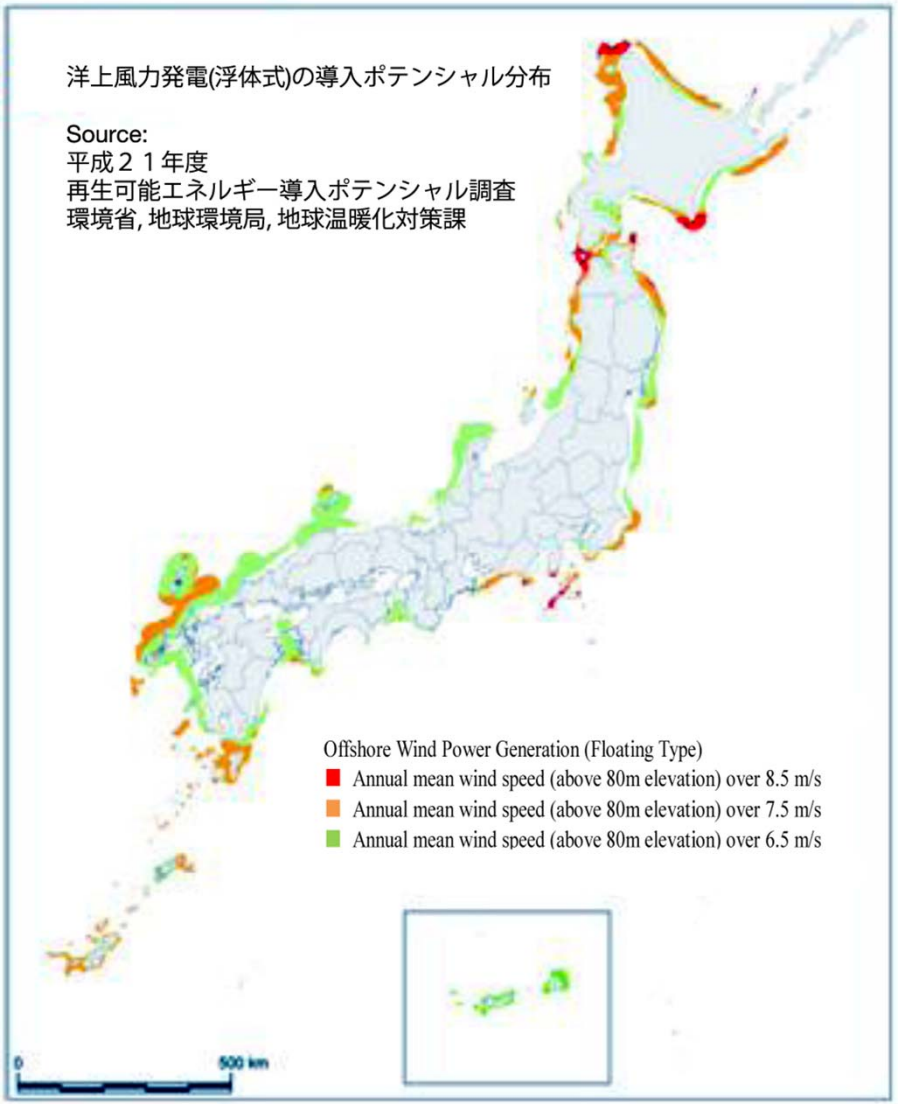
- Leading regions are
  - Hokkaido
  - Tohoku
  - Kyushu
  - Okinawa
- Best wind power potential and most installations are not close to population centers such as Tokyo, Osaka and Nagoya.

Source: http://agora.ex.nii.ac.jp/earthquake/201103-eastjapan/energy/electrical-japan/type/7.html.ja

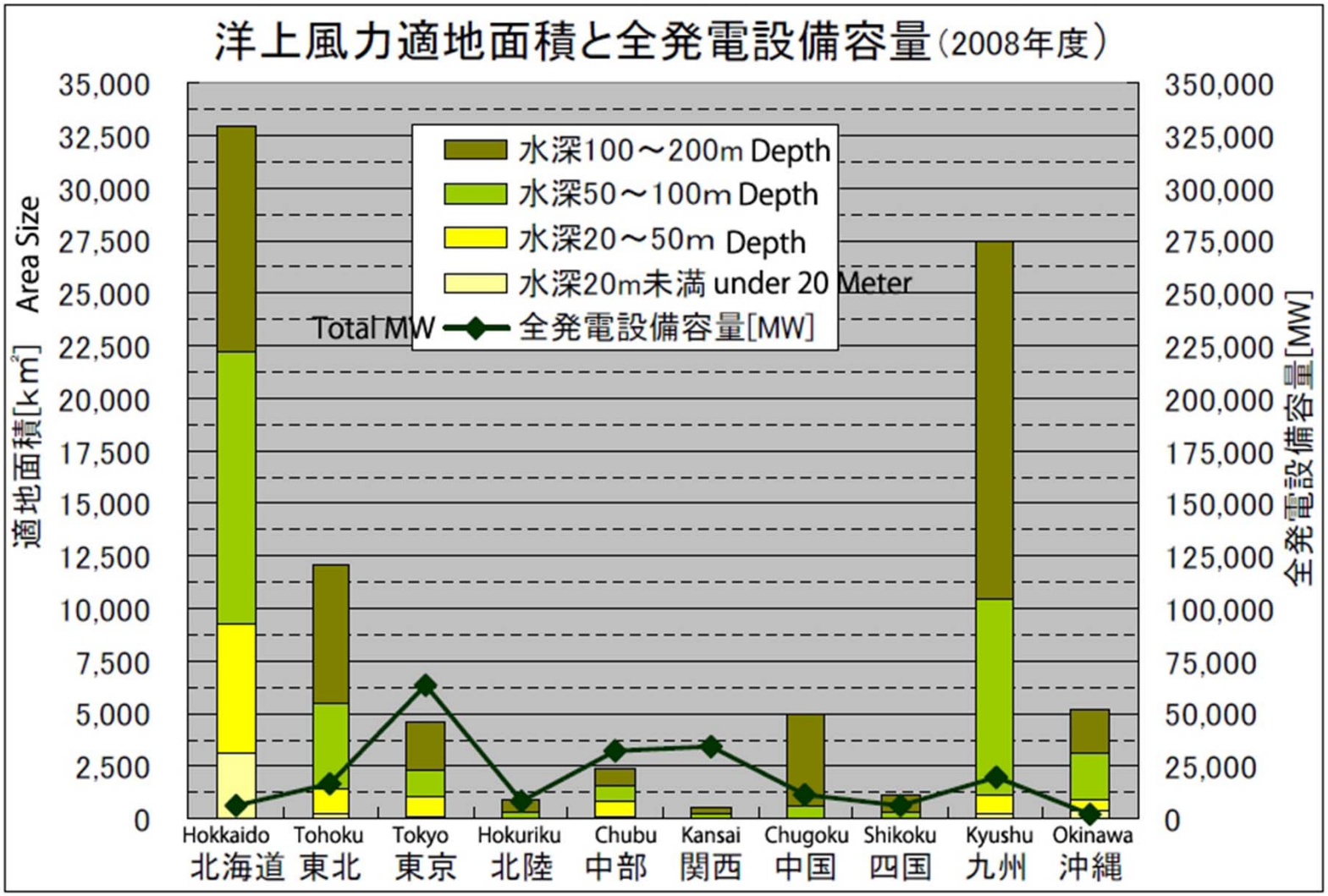
Offshore Wind Power Potential for fixed and floating Type Foundations (2011)

Floating Foundation Technology is required.





Offshore Wind Potential Areas, MW Potential and Water Depth

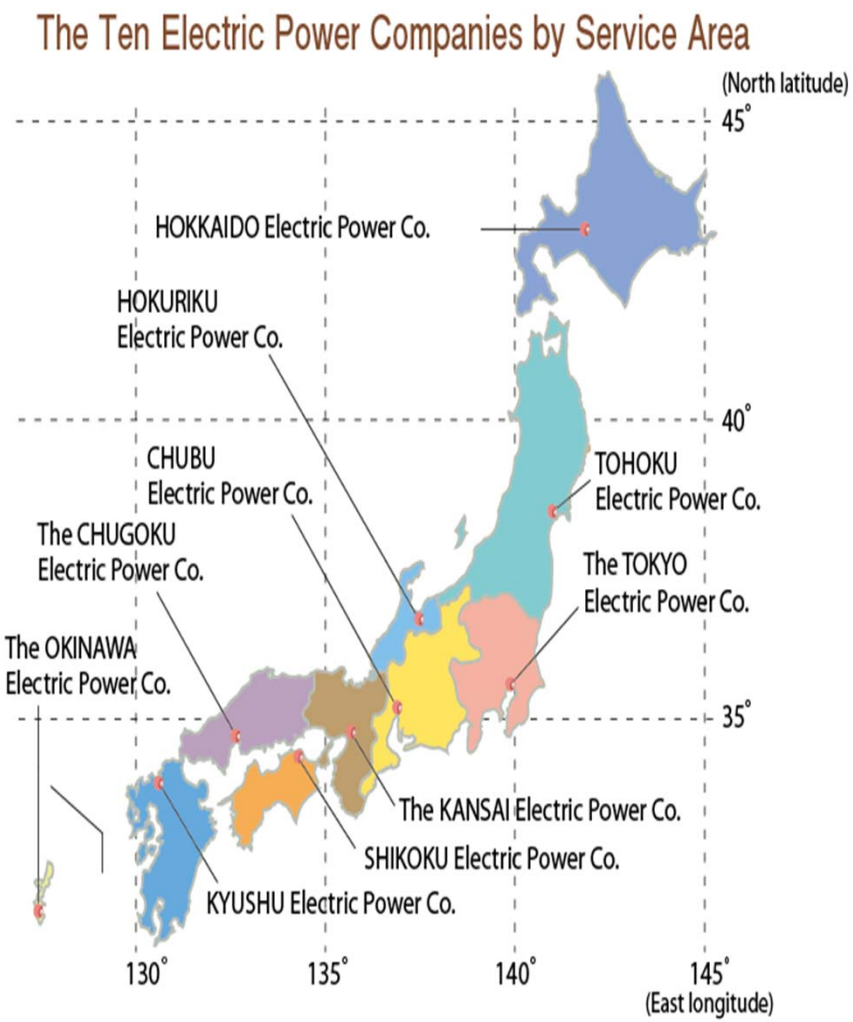


洋上風力合計の水深別適地面積（年間平均風速 7m/s 以上）

Offshore Wind Potential by Water Depth Area (at average speed of 7 meters/s and more)

Source: Japan Wind Power Association 一般社団法人　日本風力発電協会　２０１０

Utility Companies and Power Generation in Japan



Japan's electric power market is basically 'owned' by the nation's 10 power companies who cover different geographic areas. Interconnection between their grids is underdeveloped.

Japan's utilities are power producers and distributors; they own the transmission and unlike the United States there are no independent transmission system operators.

There are a few independent power producers but they only supply 2% of Japan's total generation.

There is no grid connection to the island of Okinawa nor the Asian mainland.

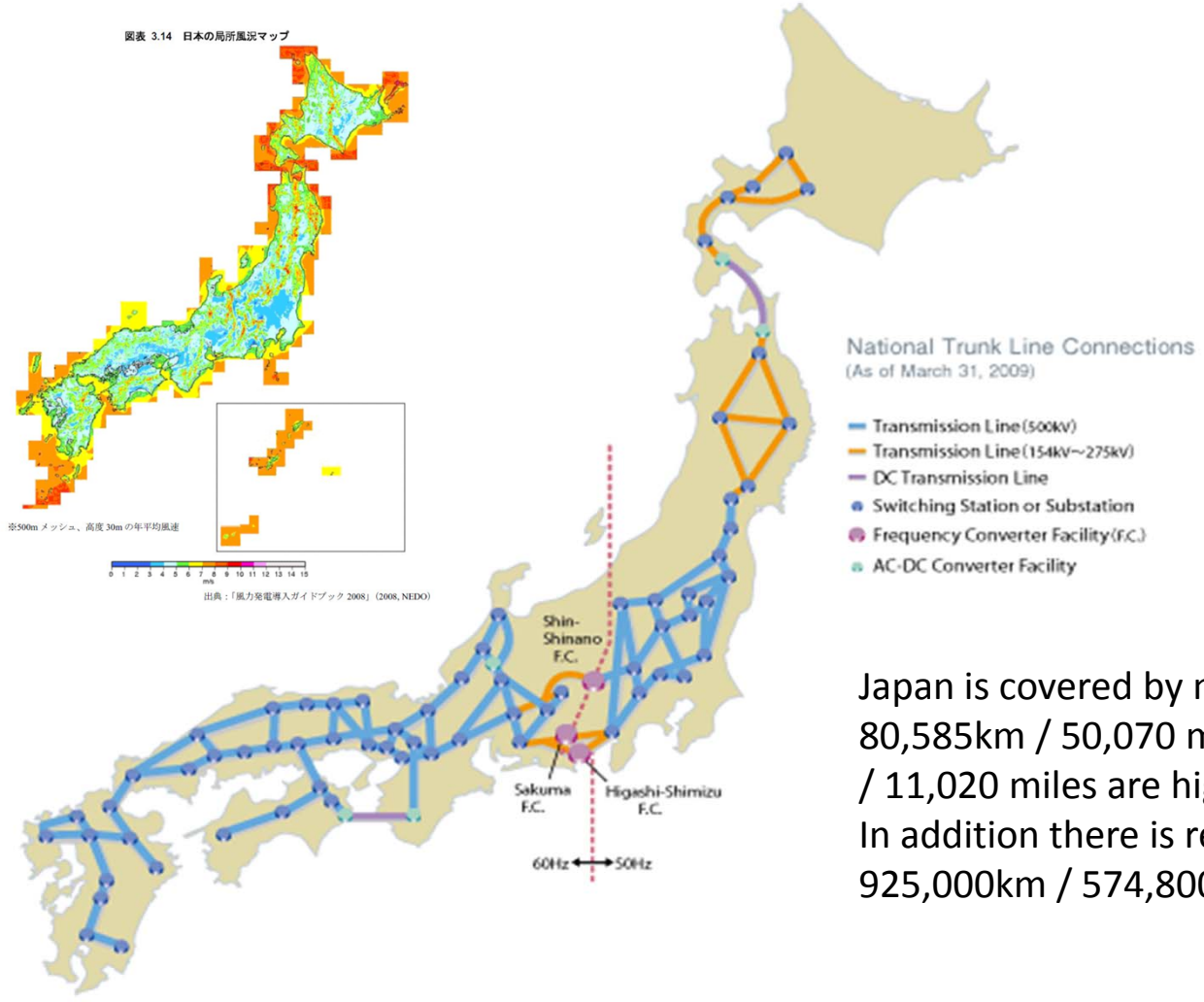
Eastern and Western Japan have a frequency difference of 60hz (west) and 50hz (east).

Due to the terrain as well as earthquakes most of Japan's transmission is above ground.

Especially the load capacities of the regional transmission are limited and pose a challenge with regards to increased use of renewable energy technologies.

Source: Source: FEPC Electricity Review Japan 2010

Utility Companies and Power Generation in Japan



Japan is covered by major transmission of 80,585km / 50,070 miles. Of this length 17,731km / 11,020 miles are high voltage transmission lines. In addition there is regional transmission of 925,000km / 574,800 miles.

Source: Source: FEPC Electricity Review Japan 2010

Power Generation from Renewables 1990 - 2009

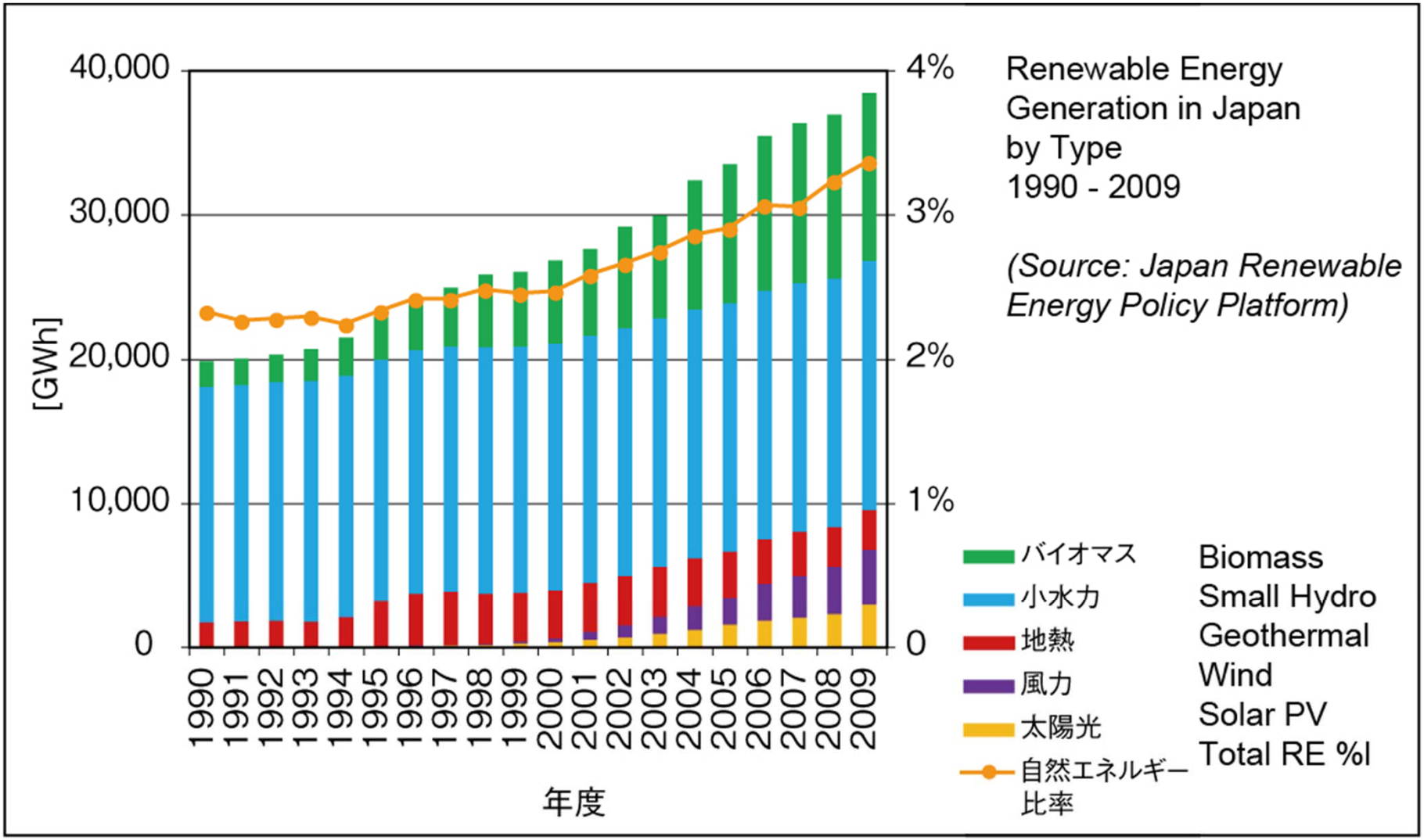


図 1-1 日本国内の自然エネルギーによる発電量の推計

Power Generation related Legislative and Permitting Authorities

The following ministries and administrative entities are in charge of energy related policy and legislation:

- The Ministry of Economy, Trade and Industry (METI) supervises the energy sector with regards to legislation via the Agency for Natural Resources and Energy (ANRE)
- The Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Environment are also involved in some aspects of the energy market.
- The New Energy and Industrial Technology Development Organization (NEDO) is a public corporation supervised by METI and in charge of financing as well as implementing numerous R&D projects as well as market supervision.
- The Ministry of Land, Infrastructure and Transport (MLIT) is involved in the construction permitting process of new energy installations.
- The Ministry of the Environment is involved regarding the requirement of Environmental Impact Assessment for e.g. onshore wind as well as other power generation and infrastructure projects.

経済産業省 Ministry of Economy, Trade and Industry

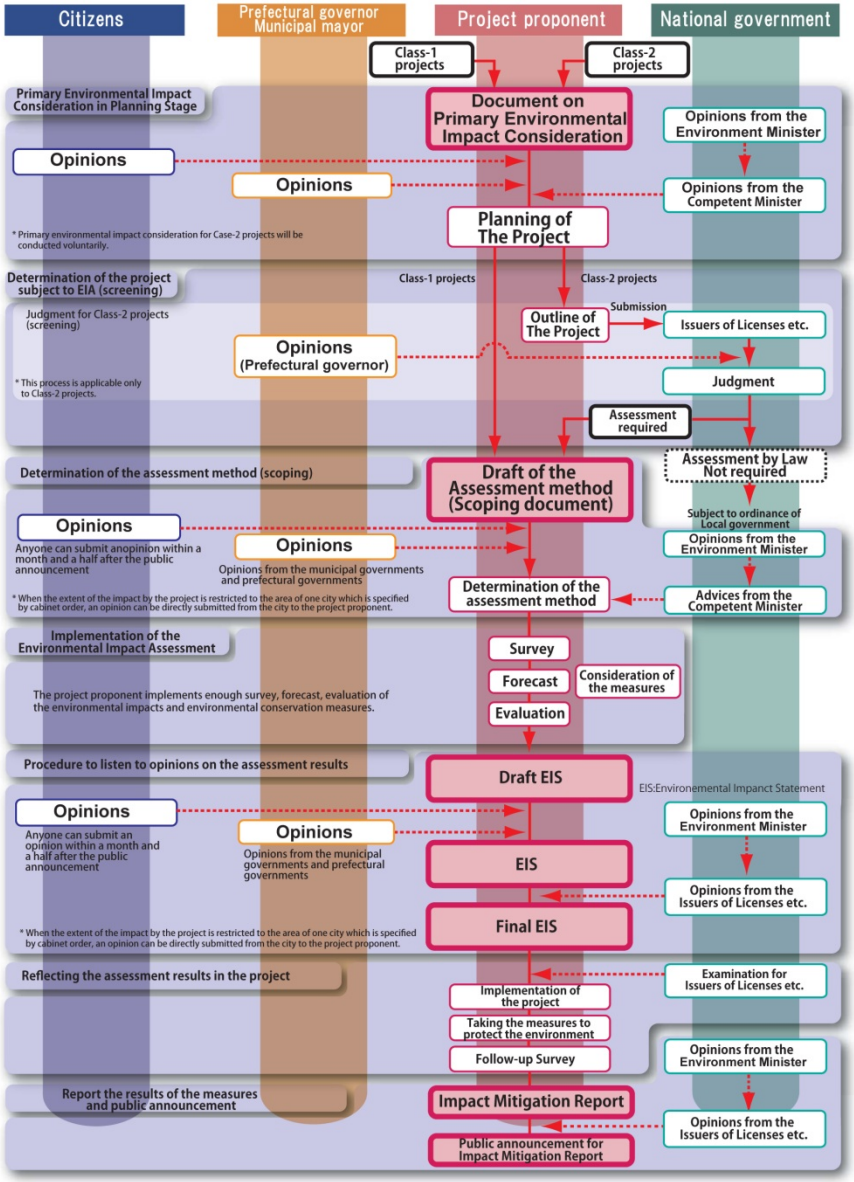
文部科学省 MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY-JAPAN

環境省 Ministry of the Environment

国土交通省 Ministry of Land, Infrastructure, Transport and Tourism

NEDO 独立行政法人 新エネルギー・産業技術総合開発機構

Procedure of EIA



Source: http://www.env.go.jp/policy/assess/1-3outline/img/pamph_e.pdf

Environmental Impact Assessment (EIA) Requirements for Onshore Wind:

- Class 1 Projects of 10MW or more will always require an EIA.
- Class 2 Projects of 7.5MW to 10MW may require an EIA. Class 2 projects are projects “for which the judgment whether to follow the procedure for
- EIA is determined individually.”

For more detailed information and references visit: http://www.env.go.jp/policy/assess/1-3outline/img/pamph_e.pdf

Industry estimates are that this new EIA requirement will add three to five years to the time needed to build a wind project.

Japan Wind Energy Cost Structure

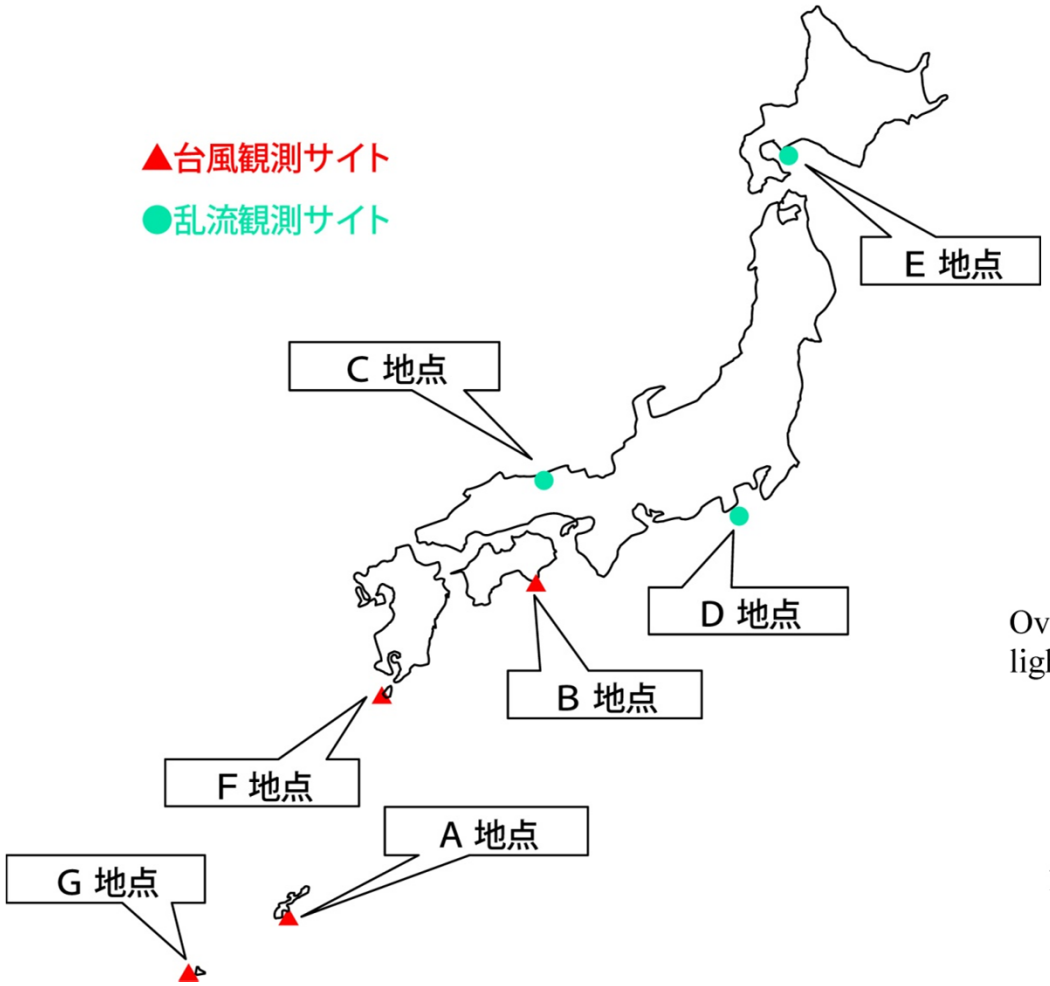
Under the co-operative investigation by METI, New Energy and Industrial Technology Development Organization (NEDO), JWPA, and the Japan Wind Energy Association (JWEA) values/costs are estimated as follows:

- Turbine cost: 200,000 JPY/kW (1,792 euro/kW; 2,408 USD/kW)
- Installed project cost: 300,000 JPY/ kW (2,688 euro/kW; 3,612 USD/kW)
- COE: 11.0 JPY/kWh (0.098 euro/ kWh; 0.132 USD/kWh)
- Wind electricity purchase price 7 to 9 JPY/kWh (0.063 to 0.081 euro/ kWh; 0.083 to 0.107 USD/kWh),
- O&M costs: 6,000 JPY/kW/unit/yr (53 euro/kW/unit/yr; 71 USD/kW/unit/yr)
- Subsidy: 0.8 multiplied by one third of initial investment (expired incentive).

Generation Type	Cost (Yen per kWh)
Hydro Power (15MW)	8.2 – 13.3
Oil (400MW)	10.0 – 17.3
LNG (1.5GW)	5.8 – 7.1
Coal (900MW)	5.0 – 6.5
Nuclear (1.3GW)	4.8 – 6.2
Solar PV (Residential Use)	46
Wind (4.5MW – 30MW)	10 - 14

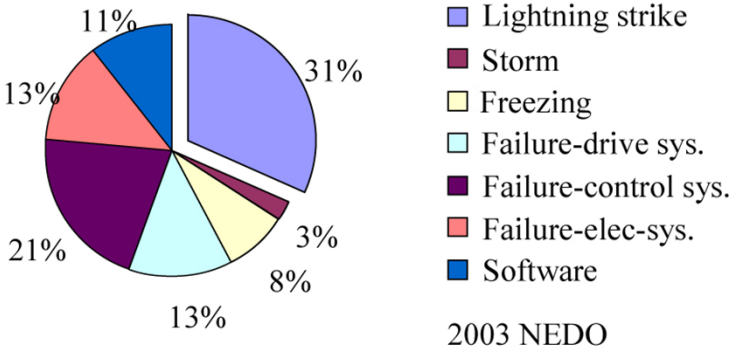
Source: *Hydropower as a Renewable Energy Source in a New Ear.* Quarterly Review No. 36 July 2010

Examples of Taiphoon Wind Speeds



Site	Max Wind Speed m/s
A	73
B	47
C	48
D	58
E	34
F	48
G	46

Over 30% of wind turbine failures were caused by lightning strike in Japan as indicated in figure 3.

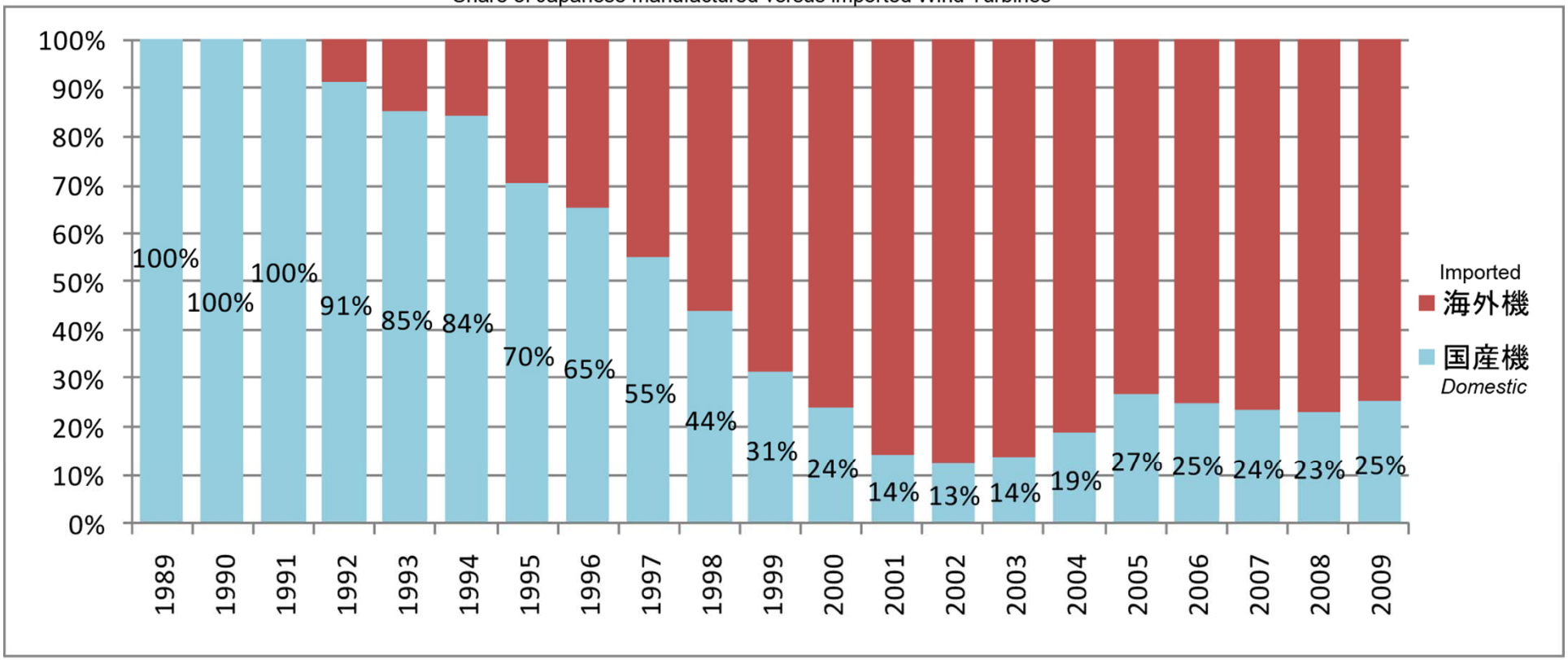


The high number of lightning strikes as well as Taiphoon damage led the development of the J-Standards for Turbines.

The Japanese Wind Turbine Market is dominated by non-Japanese Turbines

図表 3.33　国内における海外機・国産機別導入割合（累積基数）の推移

Share of Japanese manufactured versus imported Wind Turbines



Source: 出典：NEDO 資料より作成

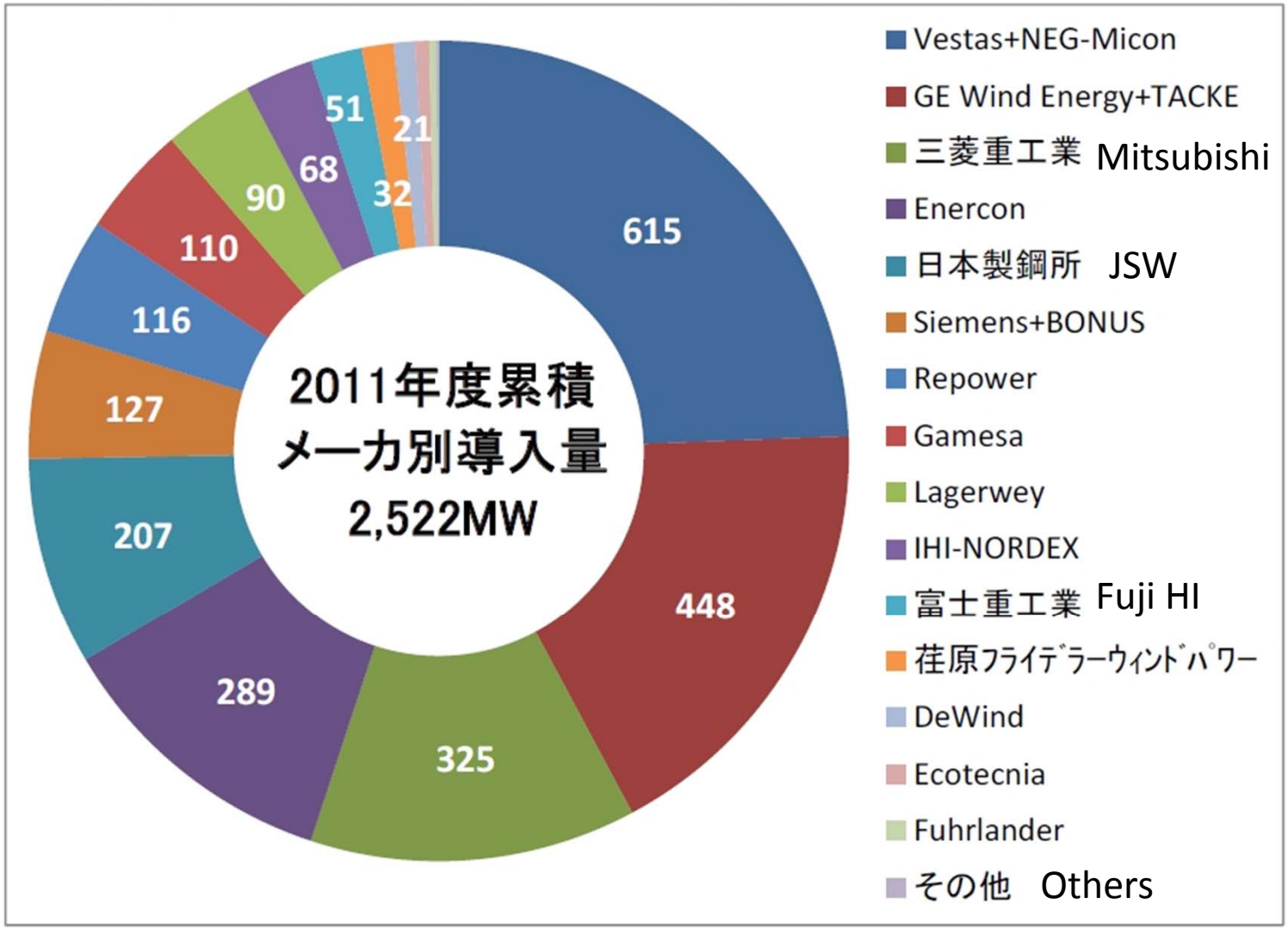
Japanese Wind Turbine Manufacturers and Models operating in Japan

Manufacturer	Model	Key Specs
Mitsubishi HI	MWT 92/2.4	2.4MW, D=92m, Upwind, Smart Yaw Control
	MWT=1000A	1.0MW, D=61.4m, Upwind, Smart Yaw Control
Fuji HI	Subaru 80/2.0	2.0MW, D=80, Downwind
JSW (Japan Steel Works)	J70/J82	2.0MW, D=70.65/82.6m, Upwind
Komai Tekko Inc.	KWT300	300kW, D=33m, Upwind

Hitachi sells Fuji's Subaru branded turbines.

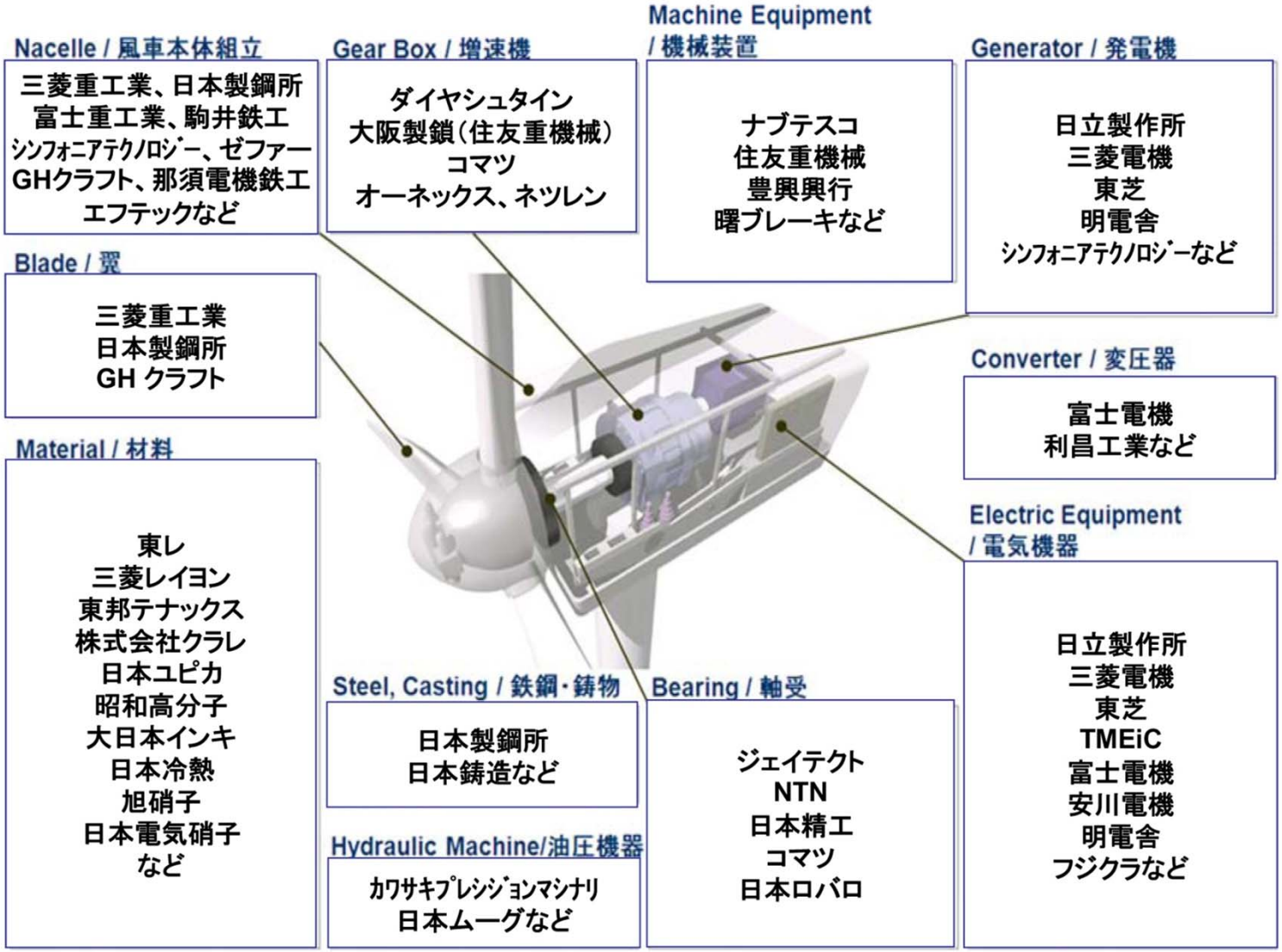
Japan Market Share by Manufacturer by MW (2011)

2011年度(2012 年 3 月末)の推定メーカー別導入量



Source: Japan Wind Power Association / NEDO

Japan does have a wind power supply chain, also selling to non-Japan manufacturers.



Installed REpower Turbines in Japan (based on MIC Research)

	Total kW	# of Turbines	Turbine kW	Installation	Region	Manufacturer	Model	Operator
Aino-cho (1,500 kW, 1 turbine)	1,500	1	1,500	2003	Kyushu	Repower	MD70	N/A
Tempu-maru (1,500 kW, 1 turbine)	1,500	1	1,500	2003	Tohoku	Repower	N/A	Community Wind Power Co.
Ten-no-cho (1,500 kW, 1 turbine)	1,500	1	1,500	2003	Kanto	Repower	MD 70	N/A
Hashima (1,500 kW, 1 turbine)	1,500	1	1,500	2004	Kyushu	Repower	MD 70	N/A
Mushigamine (9,000 kW, 6 turbines)	9,000	6	1,500	2004	Hokuriku	Repower	MD 77	Meidensha Wind Power
Nawa-cho (1,500 kW, 1 turbine)	1,500	1	1,500	2004	Chugoku	Repower	MD 77	Meidensha Wind Power
Shizuoka City (1,500 kW, 1 turbine)	1,500	1	1,500	2004	Tokai	Repower	MD 70	N/A
Hojyo-cho (13,500 kW, 9 turbines)	13,500	9	1,500	2005	Chugoku	Repower	MD 70	N/A
Akita Marina (1,500 kW, 1 turbine)	1,500	1	1,500	2006	Tohoku	Repower	MD77	N/A
Akita Mukaihama (1,500 kW, 1 turbine)	1,500	1	1,500	2006	Tohoku	Repower	MD77	N/A
Hachiryu (25,500 kW, 17 turbines)	25,500	17	1,500	2006	Tohoku	Repower	MD 77	Mwinds
Kantaro (1,500 kW, 1 turbine)	1,500	1	1,500	2006	Hokkaido	Repower	N/A	Community Wind Power Co.
Kazekomachi (1,500 kW, 1 turbine)	1,500	1	1,500	2006	Tohoku	Repower	N/A	Community Wind Power Co.
Tahara (22,000 kW, 11 turbines)	22,000	11	2,000	2006	Tokai	Repower	M82	N/A
Tahara City (2,000 kW, 1 turbine)	2,000	1	2,000	2006	Tokai	Repower	M82	N/A
Monzen (22,550 kW, 11 turbines)	22,550	11	2,050	2010	Hokuriku	Repower	MM82/2050	Community Wind Power Co.
Tokiwa (26,650 kW, 13 turbines)	26,650	13	2,050	2010	Tohoku	Repower	MM82/2050	N/A
Total	**136,200**	**78**						

Distribution based on agreement with Meidensha Corporation (2002)

Installed Vestas Turbines in Japan (based on MIC Research)

	Total kW	# of Turbines	Turbine kW	Installation	Region	Manufacturer	Model	Operator
Koga, Fukuoka (225 kW, 1 turbine)	225	1	225	1995	Kyushu	Vestas	N/A	Electric Power Development Co.
Hitachi Ibaraki (2,225 kW, 2 turbines)	2,225	2	1,113	1997	Kanto	Vestas	N/A	Hitachi
Wakkanai city (225 kW, 1 turbine)	225	1	225	1998	Hokkaido	Vestas	N/A	Wakanai City and NEDO
Nikaho (24,750 kW, 15 turbines)	24,750	15	1,650	2001	Tohoku	Vestas	N/A	J Power
Sarakitomanai (14,850 kW, 9 turbines)	14,850	9	1,650	2001	Hokkaido	Vestas	N/A	J Power
Tokyo Windside (1,700 kW, 2 turbines)	1,700	2	850	2003	Kanto	Vestas	V52/850	J Power
Kuzumaki (21,000 kW)	21,000	12	1,750	2003	Tohoku	Vestas	N/A	J Power
Hokkaido (1,200 kW, 2 turbines)	1,200	2	600	2004	Hokkaido	Vestas	V47/660	NEDO (For research)
Setana (1,320 kW, 2 turbines)	1,320	2	660	2004	Hokkaido	Vestas	V47/660	Setana City, NEDO
Sakata (10,000 kW, 5 turbines)	10,000	5	2,000	2004	Tohoku	Vestas	V90 / 2000	Summit Wind Power
Sakata City (16,000 kW, 8 turbines)	16,000	8	2,000	2004	Tohoku	Vestas	V8 2.0	Summit Wind Power
Kazeru-chan (1,500 kW, 1 turbine)	1,500	1	1,500	2005	Hokkaido	Vestas	N/A	Community Wind Power Co.
Karinpu (1,650 kW, 1 turbine)	1,650	1	1,650	2006	Hokkaido	Vestas	N/A	Community Wind Power Co.
Oguni-cho (26,000 kW)	26,000	15	1,733	2006	Kyushu	Vestas	N/A	J Power
Yokohama (2,000 kW, 1 turbine)	2,000	1	2,000	2007	Kanto	Vestas	V80/2000	N/A
Atsumi (18,500 kW, 11 turbines)	18,500	11	1,682	2007	Honshu	Vestas (4), GE (7	N/A	Japan Wind Development Company Ltd.
Shin Izumo (78,000 kW, 26 turbines)	78,000	26	3,000	2009	Chugoku	Vestas	V90/3000	Eurus Energy
Total	**221,145**	**114**						

Installed Mitsubishi Turbines in Japan (based on MIC Research)

	Total kW	# of Turbines	Turbine kW	Installation	Region	Manufacturer	Model	Operator
Kouygi, Nagasaki (250 kW, 1 turbine)	250	1	250	1985	Kyushu	Mitsubishi	N/A	Mitsubishi Heavy Industry
Kojikijima, Kagoshima (250 kW, 1 turbine)	250	1	250	1990	Kyushu	Mitsubishi	N/A	Kushima City
Kouyagi, Nagasaki (250 kW, 1 turbine)	250	1	250	1990	Kyushu	Mitsubishi	N/A	Mitsubishi Heavy Industry
Seto Ehime (100 kW, 1 turbine)	100	1	100	1991	Shikoku	Mitsubishi	N/A	Seto City
Hekinan Aichi (250 kW, 1 turbine)	250	1	250	1992	Chubu	Mitsubishi	N/A	Chubu Electric Power
Tomari (1,100 kW, 4 turbines)	1,100	4	275	1993	Hokkaido	Mitsubishi	N/A	Hokkaido Electric Power Company
Shiga, Ishikawa (275 kW, 1 turbine)	275	1	275	1994	Hokuriku	Mitsubishi	N/A	Hokuriku Electric Power Group
Muroto, Kouchi (300 kW, 1 turbine)	300	1	300	1994	Shikoku	Mitsubishi	N/A	Shikoku Electric Power Co.
Omaezaki Shizuoka (300 kW, 1 turbine)	300	1	300	1996	Chubu	Mitsubishi	N/A	Shizuoka prefecture
Arao, Kumamoto (250 kW, 1 turbine)	250	1	250	1997	Kyushu	Mitsubishi	N/A	Nippon Shokuhin
Hiraizumi, Iwate (490 kW, 1 turbine)	490	1	490	1997	Tohoku	Mitsubishi	N/A	NEDO (For research)
Kasasa, Kagoshima (1,500 kW, 5 turbines)	1,500	5	300	1998	Kyushu	Mitsubishi	N/A	Kyushu Electric Power Company
Konagai, Nagasaki (300 kW, 1 turbine)	300	1	300	1998	Kyushu	Mitsubishi	N/A	NEDO and Konaga city
Kamino (1,000 kW, 2 turbines)	1,000	2	500	1998	Hokkaido	Mitsubishi	N/A	NEDO and Kamino city
Moroccan (1,500 kW, 2 turbines)	1,500	2	750	1998	Hokkaido	Mitsubishi	N/A	Muroran City
Aguni (250 kW, 1 turbine)	250	1	250	1999	Okinawa	Mitsubishi	N/A	The Okinawa Electric Company
Otashiki (250 kW, 1 turbine)	250	1	250	1999	Okinawa	Mitsubishi	N/A	The Okinawa Electric Company
Ituwa, Kumamoto (300 kW, 1 turbine)	300	1	300	1999	Kyushu	Mitsubishi	N/A	Mitsui Greenland
Tonaki jima Island (300 kW, 1 turbine)	300	1	300	1999	Kyushu	Mitsubishi	N/A	Kyushu Electric Power Company
Yoshioka, Gunma (300 kW, 1 turbine)	300	1	300	1999	Kanto	Mitsubishi	N/A	Yoshioka City
Zao (300 kW, 1 turbine)	300	1	300	1999	Tohoku	Mitsubishi	MWT-300-29	J Power
Sotoumi, Nagasaki (600 kW, 1 turbine)	600	1	600	2000	Kyushu	Mitsubishi	N/A	Ikeshima Coal Co.
Sadamisaki (11,000 kW, 11 turbines)	11,000	11	1,000	2003	Shikoku	Mitsubishi	MWT-1000s	Daiwa House
Kamaishi (43,000 kW, 43 turbines)	43,000	43	1,000	2004	Tohoku	Mitsubishi	N/A	Eurus Energy
Hasaki Ibaraki (1,000 kW)	1,000	1	1,000	2005	Ibaraki	Mitsubishi	MWT-1000A	Local Fisheries Co-op
Soya Misaki (57,000 kW, 57 turbines)	57,000	57	1,000	2005	Hokkaido	Mitsubishi	MWT-1000A	Eurus Energy
Magunrun-chan (1,000 kW, 1 turbine)	1,000	1	1,000	2006	Hokkaido	Mitsubishi	N/A	Community Wind Power Co.
Nagashima (50,400 kW, 21 turbines)	50,400	21	2,400	2008	Kyushu	Mitsubishi	2.4MW	Kyushu Electric Power Company
Fukura 1 (9,600 kW, 4 turbines)	9,600	4	2,400	2010	Hokuriku	Mitsubishi	MWT92/2.4	Hokuriku Electric Power Group
Fukura 2 (12,000 kW, 5 turbines)	12,000	5	2,400	2010	Hokuriku	Mitsubishi	MWT92/2.4	Hokuriku Electric Power Group
Tappi, Aomori (3,375 kW, 11 turbines)	3,375	11	307	1992/1995/1	Tohoku	Mitsubishi	N/A	Tohoku Electric Power Company
Irago (1,000 kW, 1 turbine)	1,000	1	1,000	N/A	Chubu	Mitsubishi	MWT-1000-61	N/A
Seto (19,000 kW, 15 turbines)	19,000	15	1,267	2003/2007	Shikoku	Mitsubishi / Gamesa	N/A -G80/200	Eurus Energy
Hioki, Yamaguchi (1,370 kW, 11 turbines)	1,370	11	125	1996	Chugoku	Mitsubishi/Kenetec	N/A	Chugoku Electric Power Company
Miyako island (2,800 kW, 7 turbines)	2,800	7	400	1992/1993/1	Okinawa	Mitsubishi/NEG Micon/Vestas/ Enercon	N/A	The Okinawa Electric Company
Ikata (24,750 kW, 15 turbines)	24,750	15	1,650	2002/2005	Ehime	Mitsubishi/Vestas	MWT-1000/V	Town of Ikata & Mitsubishi Heavy Industrie
Total (excl. mixed Wind Farms)	**199,790**	**186**						

Major Wind Power Developers and Operators

Developer/Operator	HQ	Ownership Structure	Geograpic Focus	Operating MW
Eurus Energy	Tokyo	Tokyo Electric Power Company, Incorporated: 60% / Toyota Tsusho Corporation: 40%	Europe (820MW), Asia (679MW), US (634MW)	537
J Power	Tokyo	Japan's larges utility company	Japan	353
CEF Clean Energy Factory Inc.	Nemuro	Private Developer (uses Vestas and GE)	Japan	195
Eco Power Company Ltd.	Tokyo	Major Sharehold Cosmo Oil Co., Ltd.	Japan	147
Summit Wind Power	Sakata	Sumitomo Group	Japan, US	36
Wind Power Ibaraki	Mito	Mitani Group	Japan	14
			TOTAL	**1,282**

- In the 1990s various Japanese utilities, especially Okinawa Electric Power Co. and Kyushu Electric Power Co. built and operated various wind farms with capacity of ca. 50-100MW. However, these projects are no longer included in their portfolio.
- Japan has many single or two turbine facilities, operated by municipalities, schools, universities or for research. Of Japan's 360 Wind Farms, 275 have a capacity below 10MW and combined a total capacity of 485MW.
- Other wind farms are operated by large corporations such as Mitsubishi Fuso or Hitachi to reduce their carbon foot print.
- J-Power is testing a full scale floating foundation with 2MW turbine in 2012 (Kyushu)
- Cosmo announced in December 2011 to increase their wind power activity and investment.

Wind Power in Japan Post-Fukushima

- The Fukushima Nuclear Disaster is forcing the government to re-design the power generation strategy for Japan.
- Renewable Energy including Wind Power is likely to play a major role; however, solar PV as well as geothermal and hydro power will continue to compete with wind power.
- Power companies are realizing that renewable energy will require better grid connection as well as co-operation re. transmission.
- Industrial giants such as Mitsubishi and Hitachi are re-starting their floating offshore foundation projects.

- Tokyo has been supplied predominantly by nuclear power from Fukushima. Replacing this power source is a big challenge.
- The JWPA roadmap projects wind power in Japan up to 50GW (combined on and offshore) by 2050 with an interim target of 11.1GW by 2020.

Outline of Japan's New Feed In Tariff Law (effective July 1st, 2012)

- Passed in August 2011 (The Act on Special Measures concerning the Procurement of Renewable Electric Energy by Operators of Electric Utilities)
- Under the Act, Japanese electric utility operators are obligated to purchase solar, wind, hydro, geothermal and biomass generated electricity for contractual terms and at prices to be fixed by the Minister of Economy, Trade and Industry ("METI").
- Electric utility operators are required to enter into PPAs with suppliers of Renewable Electricity that have obtained the above approval of METI ("Specified Suppliers") and to interconnect their electric transmission and other electricity facilities with the power generation facilities of the Specified Suppliers.
- Price and term for PPAs is varies by the type, installation mode, scale and other factors of the relevant Renewable Electricity source and is to be determined by METI after consulting other relevant governmental ministries, and based on the opinion of the "Procurement Price Calculation Committee" (consisting of five members appointed by METI with the approval of the Diet). In determining the price and term of the PPAs , the Act requires METI to respect the opinion of the Procurement Price Calculation Committee.
- For the purpose of intensively expanding renewable electricity generation, the Act requires METI to "give particular consideration" to the profit that Specified Suppliers should make when setting the purchase price for power purchase agreements during the period of three years from the Act's effective date (July 1, 2012 to June 30, 2015).
- Utilities can recover additional costs via surcharge to consumers.

Japan Renewable Energy Feed In Tariffs as set for the period July 1, 2012 to June 30, 2015 .
Similar to Germany's EEG the FITs then will be reviewed and adjusted. This does not affect existing PPAs under the previous tariffs.

Solar:
Up to 10kW – 42 Yen per kWh – 10 year PPA
Above 10KW – 42 Yen per KWh – 20 year PPA

Wind Power:
Up to 20kW – 57.75 Yen per kWh – 20 year PPA
Above 20kW – 23.1 Yen per kWh – 20 year PPA

Geothermal:
Up to 1.5MW – 42 Yen per kWh – 15 year PPA
Above 1.5MW – 27.3 Yen per kWh – 15 year PPA

Small and Medium Hydropower:
200kW to 1,000 kW – 30.45 Yen per kWh – 20 year PPA
1MW – 30MW – 25.2 Yen per kWh – 20 year PPA

Biomass:
Any capacity – 25.2 yen per kWh – 20 year PPA

Recently announced Actions by Japanese Utility Companies

- Six electric power firms in western and southwestern Japan announced in December 2011 that they have agreed to co-operate in order to expand wind-power generation by using their existing power lines to accommodate each other with power supply. *Source: Kyodo News*
- Three utilities in the Tokyo, Tohoku and Hokkaido regions in eastern Japan are also moving towards similar transmission co-operation. *Source: Kyodo News*

These type of changes would mean a major improvement of the current fragmented and regionally monopolistic utility structure and provide a major boost to renewables, including wind power.

Floating Offshore Wind Farms

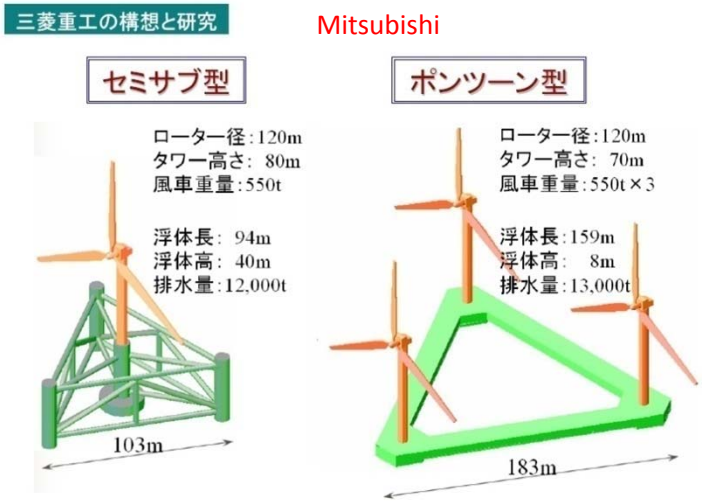
- Japan has more than 20 years of research on floating structures, including for offshore wind. Various designs have been developed to concept stage, including barge designs, semi submersibles as well as tension leg platform concepts.

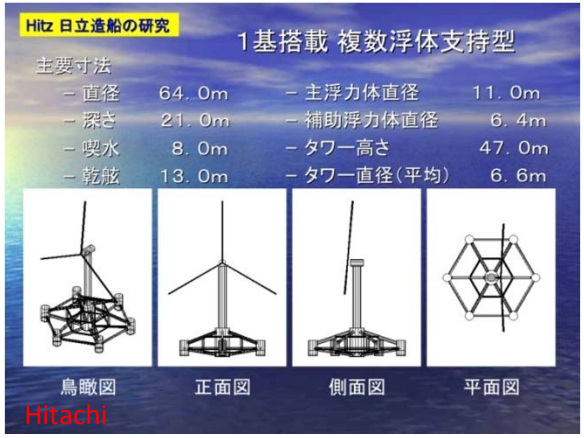
- The majority of Japanese research has been government funded. Japanese industry was however reluctant to commercialize the various research; the reasons being the absence of Japanese government subsidies for offshore wind and limited government push for offshore due to strong opposition from the Japanese fishing industry.

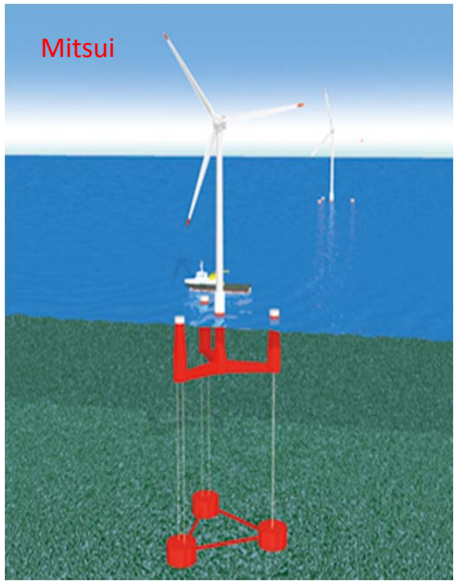
- The major earthquake and the Fukushima nuclear accident in March 2011 have changed the dynamics and floating offshore wind is getting a new 'push' in Japan:
  - On August 25th, 2011 Mitsubishi announced to invest 20 Billion Yen until 2017 for development of an offshore floating platform for the 'domestic Japanese market'. Furthermore, using British Government Funding they will also develop a 10MW turbine at their R&D Facility in the UK.
  - On September 13th, 2011 the Japanese government announced to invest US$ 250 Million in development and construction of a floating offshore wind farm off the Fukushima coast. Companies mentioned in the release as technology developers are Mitsubishi, Mitsui, Fuji Heavy Industries, IHI Marine United and Shimizu. The budget was approved by the Japanese Parliament in November and construction of a pilot wind farm with 3 different floating technologies will begin in Spring 2013.

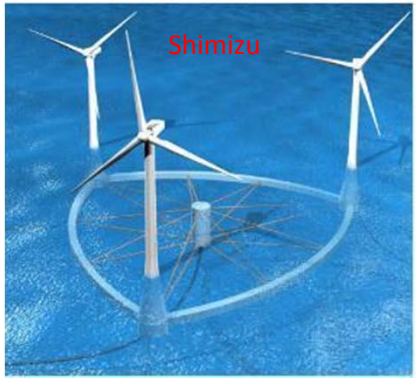
Offshore Wind Power Potential for fixed and floating Type Foundations (2011)

- Assuming 80 hub height and average wind speed of more than 6.5 m/s in a range of 10,000 kW/sq km, potential of 7.7 billion kW.
- Estimated distance from shore: less than 30km
- Water depth of 50 meter for fixed foundation and 50-200 meter for floating foundations
- Majority of potential requires floating foundations
- The following Japanese floating foundation projects are currently under development:
  - Sasebo HI, Toda Construction, Japan Hume, Kyoto University Project
    佐世保重工業，戸田建設、日本ヒューム，京都大学
  - Mitsubishi HI三菱重工業
  - Shimizu Corporation 清水建設
  - Mitsui Zosen三井造船
  - IHI Corporation (IHI Marine United)　アイ・エイチ・アイ　マリンユナイテッド
  - Hitachi Zosen 日立造船
  - National Maritime Research Institute of Japan　海上技術安全研究所
  - Kyushu University　九州大学
- There are currently 3 near shore offshore wind farms in Japan, the largest in Ibaraki (14MW), operated by Wind Power Ibaraki.









Full Report at http://maine-intl-consulting.com/resources/Floating+Offshore+Wind+Platforms+Consortia+for+web.pdf

Fukushima floating Offshore Pilot RFP of Dec. 22nd, 2011

Proposal Submission by January 25th, 2012.
Budget $160Million
This project is committed to renewable energy to achieve the world's largest floating offshore wind development, developing power plant component technology for floating offshore wind off the coast of Fukushima Prefecture by conducting an experimental study of power systems to develop a common platform for floating offshore wind power.
Site Conditions: Water depth 100-200m, Annual average wind speed: 7m / s at hub height
Maximum significant wave height: 7-14m, Distance offshore: More than 20km
Total capacity 15,000 kW or more than six turbines with per-unit output of 2,000 kW
Upwind type, downwind type, gearless type , two or more
Floating format
Semi-submersible type, spar type, TLP, preferably two or more
(1) Preliminary survey of floating offshore wind farm
(2) Development of observation and prediction of weather conditions in target site area
(3) Development of systems for floating offshore wind power
(4) Development of transmission and transformation system for floating offshore wind farm
(5) Deployment and maintenance techniques for floating offshore wind farm
(6) Coexistence of fishing and navigational safety and environmental impact assessment
(7) Development of common standards and creation of a standard for floating offshore wind

Fukushima floating Offshore Pilot RFP of Dec. 22nd, 2011 (cont'd)

Execution by:
Public and private companies who have offices or research projects in Japan. Participation of a consortium including university participation possible.
Objective to advance the formation of strategic alliances among major industries and the development of a wind energy research and development center in Fukushima Prefecture
Project period: Starting Heisei 27 (2015) for a period of 5 years
Based on the results of the interim evaluation of the budget situation and subject to change.

Budget: up to 12,499,994,000 Yen
Payment Terms: after project completion based on performance reports submitted, conducted fieldwork
Application Form RFP:
January 25, 2012 (Wed) no later than 17:00
Briefing session:
January 05, 2012 (Thursday) 16:15 am -
New Energy Policy Division Ministry of Energy Conservation Agency, METI

In February 2012, the project was awarded to a consortium led by Marubeni. For more detail visit http://maine-intl-consulting.com/resources/Floating+Offshore+Wind+Platforms+Consortia+for+web.pdf

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